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PATENT ABSTRACTS OF JAPAN

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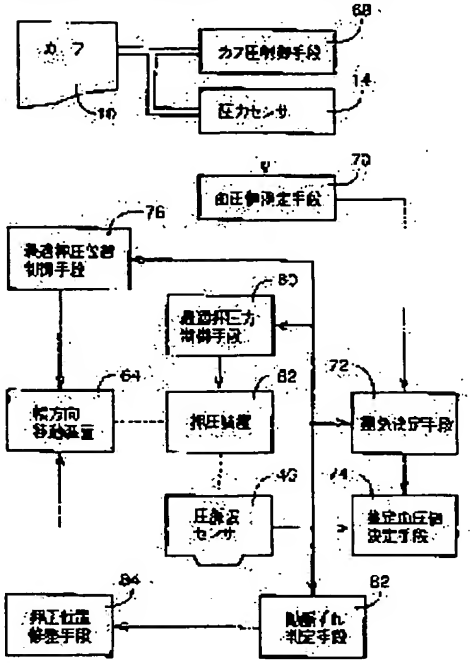
l) BLOOD VESSEL TRACKING TYPE CONTINUOUSLY BLOOD PRESSURE MONITORING APPARATUS

/)Abstract:
:OBLEM TO BE SOLVED: To provide a blood vessel tracking type ntinuously pressure monitoring apparatus which enables continuation of ıitoring a blood pressure by eliminating any deviation of an artery ickly even when the deviation of the artery is caused under the pressing a pressure pulse wave sensor during the continuously monitoring of the ıod pressure.
)LUTION: During the continuously monitoring of a blood pressure using estimated blood pressure, when the deviation of a radial artery is termined by an artery deviation judging means 82 to occur from a ɜssing surface of a pulse wave sensor 46, the pulse wave sensor 46 is ıved to a width-wise moving device 64 by a pressing force position rrecting means 84 so that the positional deviation of the pulse wave ısor 46 is reduced with the pressing force of the pressure pulse wave ısor 46 maintained at the optimum value by an optimum pressing force ntrol means 80. This can eliminates the positional deviation of the radial :ery from a reference position such as a center position pressure tector on the pressing surface of the pressure pulse wave sensor 46 :hout activating the optimum pressing force position checking action or ɜ optimum pressing force determining action, thereby achieving a quick ntinuation of monitoring a blood pressure.



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AIMS

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aim(s)]
aim 1] The pressure pulse wave sensor which has two or more pressure sensing elements arranged crosswise [of this :ry] in a press side in order to detect the pressure pulse wave generated from a living body's artery, The press ıipment which presses this pressure pulse wave sensor toward this artery, and the crosswise migration equipment ıe to move this pressure pulse wave sensor crosswise [this] in order to change the press location where this pressure se wave sensor is pressed crosswise [of this artery], An optimal press position control means to locate this pressure se wave sensor in the right above location of said artery with said crosswise migration equipment based on the ssure pulse wave detected by said pressure pulse wave sensor, An optimal press force-control means to make said ssure pulse wave sensor press with said press equipment by the optimal thrust beforehand determined that some od vessel walls of said artery will serve as abbreviation flatness, and to maintain the optimal thrust, It has a presumed od-pressure value decision means to determine serially this living body's presumed blood-pressure value based on magnitude of the pressure pulse wave detected by the pressure sensing element of said pressure pulse wave sensor n the relation set up beforehand. It is continuation blood-pressure supervisory equipment which supervises said ng body's blood-pressure value continuously with this presumed blood-pressure value. In the condition that the thrust :aid pressure pulse wave sensor is maintained by said optimal thrust with said optimal press force-control means, and l living body's presumed blood-pressure value is determined by said presumed blood-pressure value decision means artery gap judging means to judge the location gap to the press side of this pulse wave sensor of said artery, When gap to the press side of said pulse wave sensor of said artery is judged by this artery gap judging means Blood vessel :e mold continuation blood-pressure supervisory equipment characterized by including a press location correction ans to move this pulse wave sensor to said crosswise migration equipment so that a location gap of said artery may rease in the condition [that the thrust of said pressure pulse wave sensor is maintained by said optimal thrust with l optimal press force-control means].

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anslation done.]

TAILED DESCRIPTION

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etailed Description of the Invention]
01]
dustrial Application] This invention is in the condition which is supervising a living body's blood-pressure value ntinuously, and when the artery currently pressed by the pressure pulse wave sensor shifted and moves, it relates to continuation blood-pressure supervisory equipment of the format which pursues and presses the artery.
02]
escription of the Prior Art] The pressure pulse wave sensor which has two or more pressure sensing elements anged crosswise [of the artery] in a press side in order to detect the pressure pulse wave generated from a living ly's artery, The press equipment which presses the pressure pulse wave sensor toward the artery, and the crosswise gration equipment to which the above-mentioned pressure pulse wave sensor is moved crosswise in order to change press location where the pressure pulse wave sensor is pressed crosswise [of the above-mentioned artery], An imal press position control means to locate this pressure pulse wave sensor in the right above location of said artery h said crosswise migration equipment based on the pressure pulse wave detected by said pressure pulse wave sensor, optimal press force-control means to make said pressure pulse wave sensor press by the optimal thrust from which ne blood vessel walls of said artery serve as abbreviation flatness with said press equipment, and to maintain the imal thrust, It has a presumed blood-pressure value decision means to determine serially the living body's presumed od-pressure value based on the magnitude of the pressure pulse wave detected by the pressure sensing element of d pressure pulse wave sensor from the relation set up beforehand. The continuation blood-pressure supervisory uipment which supervises said living body's blood-pressure value continuously with the presumed blood-pressure ue is known. For example, the continuation blood-pressure supervisory equipment indicated by JP,8-187230,A etc. is

03]
oblem(s) to be Solved by the Invention] By the way, since it is easy to move the artery pushed in by press of a ssure pulse wave sensor toward a living body's inside to the outside of the press side when the press side of a ssure pulse wave sensor inclines in relation to a body motion etc., the above-mentioned artery may shift suddenly to press side of a pressure pulse wave sensor by contact to a body motion or a pressure pulse wave sensor during a ntinuation blood-pressure monitor. For this reason, in conventional continuation blood-pressure supervisory uipment, after stopping press of a pressure pulse wave sensor and making it isolated from a living body's skin by rting optimal press localization actuation and optimal thrust decision actuation, the check of the optimal press ation and the decision of the optimal press location were made by making it move to the migration side of a blood sel slightly, and making a pressure pulse wave sensor press again. For this reason, the inconvenience that the above-ntioned continuation blood-pressure monitor was interrupted was within the period when check actuation of these imal press location and optimal thrust decision actuation are performed.
04] The place which succeeds in this invention against the background of the above situation, and is made into the ect is to offer the blood vessel trace mold continuation blood-pressure supervisory equipment with which a gap of an ery is promptly canceled and a continuation blood-pressure monitor is continued, even if the artery currently pressed the pressure pulse wave sensor shifts during a continuation blood-pressure monitor.
05]
eans for Solving the Problem] The place made into the summary of this invention for attaining this object The ssure pulse wave sensor which has two or more pressure sensing elements arranged crosswise [of the artery] in a ss side in order to detect the pressure pulse wave generated from a living body's artery, The press equipment which sses the pressure pulse wave sensor toward the artery, and the crosswise migration equipment made to move the

ssure pulse wave sensor crosswise [the] in order to change the press location where the pressure pulse wave sensor ›ressed crosswise [of the artery], An optimal press position control means to locate the pressure pulse wave sensor he right above location of said artery with said crosswise migration equipment based on the pressure pulse wave ected by said pressure pulse wave sensor, An optimal press force-control means to make said pressure pulse wave ısor press with said press equipment by the optimal thrust beforehand set up so that some blood vessel walls of said ery might serve as abbreviation flatness, and to maintain the optimal thrust, It has a presumed blood-pressure value ision means to determine serially the living body's presumed blood-pressure value based on the magnitude of the ssure pulse wave detected by the pressure sensing element of said pressure pulse wave sensor from the relation set up orehand. It is continuation blood-pressure supervisory equipment which supervises said living body's blood-pressure ue continuously with the presumed blood-pressure value. (a) The thrust of said pressure pulse wave sensor is intained by said optimal thrust with said optimal press force-control means. With and said presumed blood-pressure ue decision means An artery gap judging means to judge the location gap to the criteria location of the press side of d pressure pulse wave sensor of said artery in the condition that said living body's presumed blood-pressure value is ermined serially, (b) When the gap to the press side of said pulse wave sensor of said artery is judged by the artery › judging means It is in including a press location correction means to move this pulse wave sensor to said crosswise gration equipment so that a location gap of said artery may decrease in the condition [that the thrust of said pressure se wave sensor is maintained by said optimal thrust with said optimal press force-control means].

›06]

fect of the Invention] If it does in this way, when the gap to the press side of said pulse-wave sensor of said artery is ged [be / it / under / by presumed blood pressure / continuous blood-pressure monitor / setting] by the artery gap ging means, the pulse-wave sensor will be moved by said crosswise migration equipment so that a location gap of pulse-wave sensor may decrease with a press location correction means in a condition [that the thrust of said ssure pulse wave sensor is maintained by said optimal thrust with said optimal press force-control means]. erefore, since the location gap to the criteria location of the press side of the pressure pulse wave sensor of said artery anceled without starting optimal press localization actuation and optimal thrust decision actuation, a blood-pressure nitor is continued promptly.

›07]

her modes of invention] Suitably here said presumed blood-pressure value decision means The inside of two or more ssure sensing elements arranged in the press side of the criteria blood-pressure-measurement value measured using cuff, and said pressure pulse wave sensor, From the relation with the magnitude of the pressure pulse wave detected the center position pressure sensing element which outputs the maximum pulse wave amplitude in comparatively low ast lower than the optimal thrust called for beforehand Based on the magnitude of the pressure pulse wave outputted m the center position pressure sensing element, said living body's presumed blood-pressure value is determined ially.

›08] Moreover, said artery gap judging means is in the condition that the thrust of said pressure pulse wave sensor is intained by said optimal thrust with said optimal press force-control means, and said living body's presumed blood-ssure value is determined by said presumed blood-pressure value decision means, suitably. It is based on the pressure se wave detected by two or more pressure sensing elements of said pressure pulse wave sensor. a 2-dimensional ›rdinate with the location shaft in which the location of the amplitude shaft in which the amplitude of the pressure se wave is shown, and the above-mentioned pressure sensing element is shown -- it is and the relation between the plitude of the pressure pulse wave and the location of a pressure sensing element is shown -- It asks, the amplitude tribution curve, i.e., the tonogram, in a press side, and the location gap to the criteria location of the press side of said ery is judged based on the symmetric property centering on the center line with which the amplitude distribution ve was set up beforehand.

›09] Suitably said artery gap judging means Moreover, the inside of said amplitude distribution curve, Each change ıdition of the area of the couple of the predetermined section of the both sides said whose center lines are pinched, example, area SL of the couple of the predetermined section of the both sides said whose center lines in an plitude distribution curve when said pressure pulse wave sensor is pressed by said press equipment by said optimal ast with said optimal press force-control means are pinched And SR Difference, Or area SL of these couples And SR ange rate deltaSL / SL And deltaSR / SR A difference or area increment deltaSL of the predetermined section of the h sides said whose center lines in a actual amplitude distribution curve are pinched And deltaSR A gap of an artery is ged based on a ratio.

›10]

ample] Hereafter, one example of this invention is explained to a detail based on a drawing.

)11] Drawing 1 is drawing showing the example of 1 configuration of the continuation blood-pressure supervisory ıipment of this invention, for example, it is used in order to supervise under an operation, the condition of the patient ɜr an operation, the living body under exercise stress test, etc. In drawing, 10 is a cuff which has rubber bag-making :he band-like bag made of cloth, for example, it is equipped with it in the condition of having been wound around a ient's overarm section 12. The pressure sensor 14, the exhaust air control valve 16, and the air pump 18 are connected :he cuff 10 through piping 20, respectively. The exhaust air control valve 16 is constituted so that it may be switched :hree conditions, the pressure supply condition of permitting supply of the pressure into a cuff 10, the **** exhaust- :-pressure condition which carries out exhaust gas pressure of the inside of a cuff 10 gradually, and the rapid exhaust- :-pressure condition which carries out exhaust gas pressure of the inside of a cuff 10 quickly.

)12] A pressure sensor 14 supplies the pressure signal SP with which the pressure in a cuff 10 is detected and the :ssure is expressed to the static pressure discriminator 22 and the pulse wave discriminator 24, respectively. The static :ssure discriminator 22 is equipped with the low pass filter, discriminates from the cuff pressure signal SK showing steady pressure contained in the pressure signal SP, and supplies the cuff pressure signal SK to an arithmetic ıuence unit 28 through A/D converter 26. It is the pulse wave signal SM 1 which the pulse wave discriminator 24 is ıipped with the band pass filter, and is the oscillating component of the pressure signal SP. It discriminates and is the se wave signal SM 1. An arithmetic sequence unit 28 is supplied through A/D converter 30. This pulse wave signal [1 The cuff pulse wave to express is a pressure oscillatory wave which occurs from the brachial artery which is not ıstrated synchronizing with a patient's heartbeat, and is transmitted to a cuff 10, and the above-mentioned pulse wave criminator 24 is functioning as a cuff pulse wave detection means.

)13] The above-mentioned arithmetic sequence unit 28 consists of so-called microcomputers equipped with CPU29,)M31, RAM33, the I/O Port that is not illustrated, and CPU29 controls the exhaust air control valve 16 and an air np 18 by performing signal processing through the actuation circuit which does not output and illustrate a driving nal from an I/O Port, using the memory storage function of RAM33 for ROM31 according to the program morized beforehand. Pulse wave signal SM 1 which is made to carry out **** pressure lowering at the rate of 3 ıHg/sec extent on the occasion of the blood pressure measurement using a cuff 10 after carrying out rapid pressure up :he pressure in a cuff 10, for example to the predetermined target preassure force, and is serially extracted in the **** ssure-lowering process Based on change of the pulse wave to express, blood-pressure values, such as a highest- od-pressure value and a lowest-blood-pressure value, are determined by the oscillometric method, and the ermined blood-pressure value is displayed on a drop 32.

'14] The pressure pulse wave detection probe 34 is equipped with the screw-thread shaft 41 by which revolution uation is carried out by the motor which was screwed in that sensor housing 36, and was formed in the actuator 39 of ıse 37, and which is not illustrated in order to move the case 37 where the sensor housing 36 which constitutes the .pe of a container is held, and this sensor housing 36 crosswise [of a radial artery 56], as shown in drawing 2 in ail. The wearing band 40 is attached in the above-mentioned case 37, and it is attached in a wrist, the side, for ımple, the left-hand side, where the cuff 10 is not wound with the wearing band 40 in the condition that the opening ;e of the sensor housing 36 which constitutes the shape of an above-mentioned container counters the body surface of the body, 42 removable. It is prepared in the interior of the above-mentioned sensor housing 36 through diaphram that the pressure pulse wave sensor 46 can be displaced relatively and possible [the projection from the opening ;e of the sensor housing 36], and the pressure room 48 is formed in it of these sensors housing 36 and diaphram 44 de. In this pressure room 48, pressure air is supplied through a pressure regulating valve 52 from an air pump 50, l, thereby, the pressure pulse wave sensor 46 is pressed by said body surface 38 by the thrust according to the ssure in the pressure room 48. In addition, at this example, the thrust of the pressure pulse wave sensor 46 is shown the pressure in the pressure room 48 (unit: mmHg).

15] The above-mentioned sensor housing 36 and diaphram 44 constitute the press equipment 62 which presses the ssure pulse wave sensor 46 toward a radial artery 56, and the above-mentioned screw-thread shaft 41 and the motor ich is not illustrated constitute, the press repositioning equipment 64, i.e., the crosswise migration equipment, which noved crosswise [of the radial artery 56] and changes the press location where the pressure pulse wave sensor 46 is ssed.

16] The above-mentioned pressure pulse wave sensor 46 for example In the cross direction of a radial artery 56, i.e., migration direction of the pressure pulse wave sensor 46 parallel to the screw-thread shaft 41, many semi-conductor ssure sensitive devices (not shown) are arranged at intervals of [fixed] about 0.2mm, and are constituted by the ss side 54 which consists of the semiconductor chip which consists of single crystal silicon etc. Pressure pulse wave ıal SM 2 with which it detects, the pressure oscillatory wave, i.e., the pressure pulse wave, which occurs from a ial artery 56 and is transmitted to a body surface 38 by being pressed on the radial artery 56 of the body surface 38 of

/rist 42, and the pressure pulse wave is expressed An arithmetic sequence unit 28 is supplied through A/D converter It is the pressure pulse wave SM 2 by which drawing 3 was detected by the pressure pulse wave sensor 46. An mple is shown.

17] CPU29 of an arithmetic sequence unit 28 performs signal processing, using the memory storage function of M33 for ROM31 according to the program memorized beforehand, outputs a driving signal through the actuation cuit which is not illustrated to an air pump 50 and a pressure regulating valve 52, and adjusts the pressure in the ssure room 48. An arithmetic sequence unit 28 determines the optimal thrust PHDPO of the pressure pulse wave sor 46 for making some blood vessel walls of a radial artery 56 into abbreviation flatness on the occasion of a itinuation blood-pressure monitor based on the pressure pulse wave serially obtained in the **** pressure variation cess in the pressure room 48, and controls a pressure regulating valve 52 to maintain the optimal thrust PHDPO. reover, highest-blood-pressure value BPSYS by which the arithmetic sequence unit 28 was measured using the cuff And lowest-blood-pressure value BPDIA By the center position pressure sensing element (active element) located it above the radial artery 56 of the semi-conductor pressure sensitive devices of the pressure pulse wave sensor 46 ere the above-mentioned optimal thrust PHDPO is maintained It asks for the response relation between the blood-ssure values BP and magnitude PM (absolute value) of a pressure pulse wave which were measured based on the k price PMmax and the minimum value PMmin of the detected pressure pulse wave. From this response relation By pressure pulse wave sensor 46 It is based on magnitude PM (top peak value) PMmax, i.e., (mmHg), the peak price, the minimum value (bottom peak value) PMmin of a pressure pulse wave which are detected serially, and is the hest-blood-pressure value MBPSYS. And the lowest-blood-pressure value MBPDIA (a presumed blood-pressure ue, i.e., a monitor blood-pressure value) is determined serially. It sets to a drop 32 and is the determined highest-od-pressure value MBPSYS. And lowest-blood-pressure value MBPDIA A digital readout is carried out for every t, and the wave which shows the presumed blood-pressure value MBP is displayed continuously.

18] The relation corresponding to the above is shown in drawing 4 , and is expressed by the formula 1. In this mula 1, the constant A indicates an inclination to be, and B are constants which show an intercept.

19]

uation 1] MBP=A-PM+B [0020] Drawing 5 is a functional block diagram explaining the important section of the trol function of the arithmetic sequence unit 28 in the continuation blood-pressure supervisory equipment constituted nentioned above. In drawing, the compression pressure force of the cuff 10 changed by the cuff pressure control ans 68 on the occasion of blood pressure measurement is detected by the pressure sensor 14. The blood-pressure ue measurement means 70 measures a living body's highest-blood-pressure value BPSYS, the mean-blood-pressure ue BPMEAN, and the lowest-blood-pressure value BPDIA (criteria blood-pressure value) according to an illometric method based on the pulse synchronizing signal obtained in the process in which the compression pressure ce by the cuff 10 is gradually changed at the rate of 2 - 3 mmHg/sec extent, for example, the pulse wave amplitude.

21] The related decision means 72 is magnitude PM of the pressure pulse wave detected by the center position ssure sensing element (active element) among two or more pressure sensing elements arranged in the press side 54 of pressure pulse wave sensor 46. The response relation between the blood-pressure values BP measured by the blood-ssure value measurement means 70 is beforehand determined, as shown in drawing 4 . The presumed blood-pressure ue decision means 74 determines continuously a living body's presumed blood-pressure value MBP from the ponse relation based on the magnitude of the pressure pulse wave detected by the above-mentioned center position ssure sensing element among two or more pressure sensing elements arranged in the press side 54 of the pressure se wave sensor 46.

22] A location [as opposed to the radial artery 56 of the pressure pulse wave sensor 46 in the optimal press position trol means 76] shifts greatly. When the predetermined renewal conditions of a press location at the time of oming that to which what detects the maximum amplitude of the pressure sensing elements arranged in the press side is located in the edge of the array locations etc. (APS starting conditions) are satisfied The comparatively small 1st ss value P1 beforehand set up in the pressure pulse wave sensor 46 by press equipment 62 lower enough than the imal thrust It is made to press. It judges whether what shows the maximum pulse wave amplitude in the condition ong each pressure sensing element of the pressure pulse wave sensor 46 is located in the center section beforehand up in the array direction of the pressure sensing element. When the decision is denied (i.e., when not located in the ter section), while making the pressure pulse wave sensor 46 once isolate from a body surface 38, after moving the ssure pulse wave sensor 46, above-mentioned actuation and decision are performed again. However, since it is in the dition that the optimal press location was obtained when that the above-mentioned decision indicates the maximum se wave amplitude to be among each pressure sensing element of the affirmation **** case 46, i.e., a pressure pulse /e sensor, is located in the center section beforehand set up in the array direction of the pressure sensing element

ıile setting up the pressure sensing element which outputs the above-mentioned maximum pulse wave amplitude as a 1-gear pressure sensing element (active element) and memorizing it, actuation of the optimal press force-control ans 80 is permitted.

)23] The optimal press force-control means 80 changes continuously the thrust of the pressure pulse wave sensor 46 ated by the optimal press location with the optimal press position control means 76, determines the optimal thrust :ed on the pressure pulse wave obtained by the process, and makes the pressure pulse wave sensor 46 press by the imal thrust PHDPO. As the optimal thrust PHDPO, for example, the press value of centering on maximum of pulse ve amplitude obtained from active element of pressure pulse wave sensor 46 like above-mentioned increment fault in ıst continuation as shown in drawing 6 predetermined within the limits, And/or, pressure pulse wave signal SM 2 |uired by the thrust process It is the press value of centering on center of flat part formed in curve (broken line of wing 6) which connects the bottom peak value SMmin in topographic contour plot table showing bottom peak value (min and thrust of pressure pulse wave sensor 46 predetermined within the limits.

·24] The artery gap judging means 82 is in the condition that the thrust of the pressure pulse wave sensor 46 is intained by said optimal thrust with said optimal press force-control means 80, and said living body's presumed od-pressure value is serially determined by said presumed blood-pressure value decision means 74, and judges the ation gap to the criteria location, for example, the mid gear, of the press side 54 of said radial artery 56. [of the ssure pulse wave sensor 46] Namely, the above-mentioned artery gap judging means 82 is based on the pressure se wave detected by the pressure sensing element of the pressure pulse wave sensor 46, respectively. It is. for mple, a 2-dimensional coordinate with the location shaft (axis of abscissa) in which the location of the amplitude ft (axis of ordinate) in which the amplitude of a pressure pulse wave as shown in drawing 7 is shown, and the above-ntioned pressure sensing element is shown -- The amplitude distribution curve in the press side 54 which shows the ıtion between the amplitude of the pressure pulse wave and the location of a pressure sensing element is searched for. : center line with which the amplitude distribution curve at the time of setting out of the optimal press location by 1 optimal press position control means 76 was set up beforehand, That is, based on a gap of the symmetric property he amplitude distribution curve acquired actually after that centering on the center position pressure sensing element tive element) location set up by the optimal press position control means 76, the location gap to the press side 54 of a ial artery 56 is judged. Since the above-mentioned amplitude distribution curve is also called tonogram and the plitude falls in inverse proportion to distance with a radial artery 56, the maximum location of the amplitude ribution curve has the property which carries out abbreviation coincidence with the core of a radial artery 56.

25] For example, each change condition of the area of the couple of the predetermined section of both sides when the ter line of the above-mentioned artery gap judging means 82 is pinched among said amplitude distribution curves, · example, the center line with which the criteria amplitude distribution curve at the time of the renewal of setting out he optimal press location by said optimal press position control means 76 or renewal of response relation (criteria ogram) was set up beforehand, Namely, area SL of the couple of the predetermined section of the both sides which : across the center position pressure sensing element (active element) location set up by the optimal press position trol means 76 And SR Change of a difference, Or area SL of these couples And SR Change rate deltaSL / SL And :aSR / SR A gap of an artery is judged based on a difference. The above-mentioned deltaSL And deltaSR It is a part area change of the predetermined section of the both sides said whose center lines in a actual amplitude distribution ve are pinched.

26] The press location correction means 84 is the process which measures presumed blood pressure continuously h said presumed blood-pressure value decision means 74. When the gap to the press side 54 of the pulse wave sensor of a radial artery 56 is judged by the above-mentioned artery gap judging means 82 In the condition [that the thrust he pressure pulse wave sensor 46 is maintained by the optimal thrust with said optimal press force-control means] The pulse wave sensor 46 is moved to crosswise migration equipment 64 so that a location gap of a radial artery 56 y decrease, namely, so that the center line of a actual amplitude distribution curve may be in agreement with the ter position pressure sensing element (active element) location set up beforehand.

27] Drawing 8 and drawing 9 are the flow charts explaining the important section of control actuation of the above-ıtioned arithmetic sequence unit 28, drawing 8 shows a main routine and drawing 9 shows the press location rection control routine which corrects the press location of the pressure pulse wave sensor 46 for decision actuation ıresumed blood pressure during activation continuously.

28] At step S1 (a step is skipped hereafter.) of drawing 8 , it is judged whether the elapsed time after response ıtion is updated by whether it is activation of the first time of S1 and last time exceeded the calibration period set up .bout ten minutes thru/or about dozens of minutes beforehand. Usually, since the decision of S1 is denied, it is judged ether it changed into the condition that what detects the maximum amplitude of the pressure sensing elements

anged [whether in S2, the predetermined renewal conditions of a press location (APS starting conditions) were sfied and] in the press side 54 of the pressure pulse wave sensor 46 is located in the edge of the array locations.
29] If the press location of the pressure pulse wave sensor 46 to a radial artery 56 is a normal range, since decision of above S2 will be denied [whether the body motion to which the press conditions of the pressure pulse wave sensor are changed in S3, so that the response relation of drawing 4 is changed was detected, and] Or it is judged whether it s satisfied based on whether it changed substantially to the blood-pressure value BP by which the monitor blood-ssure value MBP was measured using the last cuff 10, the starting conditions, i.e., the HDP starting conditions, for lating the response relation for a blood-pressure monitor.
30] It is the pressure pulse wave signal SM 2 whether since decision of the above S3 was denied when it was thought t there is no change in the press conditions of the pressure pulse wave sensor 46, and the response relation of drawing s not changing, one pressure pulse wave occurred in S8. It is based and judged. When this decision of S8 is denied, it nade to stand by by performing S1, S2, S3, and S8 repeatedly. However, if one pressure pulse wave is inputted and ision of S8 is affirmed, it will set to S9 corresponding to said presumed blood-pressure value decision means 74. ssure pulse wave signal SM 2 from the pressure pulse wave sensor 46 currently pressed by the optimal thrust DPO from -- The peak price PMmax and the minimum value PMmin of the wave motion are determined, and it is ed on the peak price PMmax and the minimum value PMmin of the pressure pulse wave from the response relation drawing 4 , and is the highest-blood-pressure value MBPSYS. And while the lowest-blood-pressure value MBPDIA esumed blood-pressure value) is determined The determined presumed blood-pressure value is serially displayed on a p 32 for every beat with the continuous wave form of the presumed blood-pressure value MBP.
31] Since said decision of S1 will be affirmed if the elapsed time after response relation is determined as last time, ile the above step is performed repeatedly exceeds the calibration period set up beforehand, after blood pressure asurement using a cuff 10 is performed in S6, response relation is updated in S7 and less than [the / account Sof k to front 8] is performed. namely, by S6 corresponding to said blood-pressure value measurement means 70, first er the exhaust air control valve's 16 operating a switch and an air pump 18 in the pressure supply condition and rying out pressure up of the pressure in a cuff 10 to the target preassure force (for example, 180mmHg(s)) higher n the highest-blood-pressure value a patient is expected to be, By making it descend at the **** pressure-lowering e to which the air pump 18 was stopped, and the exhaust air control valve 16 was switched to the **** exhaust-gas-ssure condition, and the pressure in a cuff 10 was beforehand set by 3 mmHg/sec extent Pulse wave signal SM 1 ially acquired in this **** pressure-lowering process It is based on change of the amplitude of the pressure pulse ve to express. While the highest-blood-pressure value BPSYS, the mean-blood-pressure value BPMEAN, and the vest-blood-pressure value BPDIA (criteria blood-pressure value) are measured according to the blood-pressure value ision algorithm of an oscillograph metric method known well, a pulse rate etc. is determined based on pulse wave cing. And while the blood-pressure value, pulse rate, etc. which were measured are displayed on a drop 32, the aust air control valve 16 is switched to a rapid exhaust-gas-pressure condition, and exhaust gas pressure of the inside a cuff 10 is carried out quickly.
32] Next, blood-pressure values BPSYS and BPDIA by the cuff 10 measured in S7 corresponding to said related ision means 72 in the magnitude (an absolute value, i.e., magnitude of the pressure pulse wave signal SM 2) of the ssure pulse wave from the pressure pulse wave sensor 46, and the above S6 The response relation of a between is led for and updated. Namely, highest-blood-pressure value BPSYS measured by the cuff 10 in the peak price PMmax hese pressure pulse waves and the minimum value PMmin, and S6 while one beat of pressure pulse waves from the ssure pulse wave sensor 46 was read and the peak price PMmax and the minimum value PMmin of the pressure se wave were determined And lowest-blood-pressure value BPDIA It is based and the response relation between the gnitude of a pressure pulse wave and the blood-pressure values which are shown in drawing 4 is determined.
33] The press location to the radial artery 56 of said pressure pulse wave sensor 46 shifts greatly. When the determined renewal conditions of a press location at the time of becoming that to which what detects the maximum plitude of the pressure sensing elements arranged in the press side 54 is located in the edge of the array locations etc. satisfied In the APS control routine of S4 corresponding to said optimal press position control means 76 since said ision of S2 is affirmed While the optimal press location for the center position pressure sensing element which is the ximum amplitude location of the amplitude distribution curve of drawing 7 to make it located in the center of reviation of the press side 54 is determined In the HDP control routine of S5 corresponding to said optimal press ce-control means 80 after the center position pressure sensing element at that time was set up as an active element l the pressure pulse wave sensor 46 was positioned in the optimal press location After the thrust from which the ximum amplitude of the pressure pulse wave detected by the center position pressure sensing element located right ve an artery 56 is obtained was determined as optimal thrust PHDPO and updated in the process in which the thrust

:he pressure pulse wave sensor 46 is heightened continuously, The thrust of the pressure pulse wave sensor 46 is held the optimal thrust PHDPO. And where the pressure pulse wave sensor 46 is pressed by the optimal thrust PHDPO, ; than [future / S6] is performed. Moreover, when decision of the above S2 is denied and said decision of S3 is .rmed, below the HDP control routine of the above S5 is performed.

·34] Under the actuation by which the thrust of the pressure pulse wave sensor 46 is held by the optimal thrust DPO, and a living body's blood-pressure value is hereafter supervised continuously in the above-mentioned main .tine, That is, in the period when S1, S2, S3, S8, and S9 are performed repeatedly, the press location correction ıtrol routine which corrects the press location of the pressure pulse wave sensor 46 so that the radial artery 56 which ved when a gap of a radial artery 56 occurred may be pursued and a gap may be canceled is explained using drawing

·35] a ****** [that response-related updating (cuff calibration) shown in drawing 4 in S7 corresponding to the ıted decision means 72 was performed in SS1 of drawing 9] -- or in S5 corresponding to the optimal press force-ıtrol means 80, it is judged whether the optimal thrust PHDPO of the pressure pulse wave sensor 46 was updated. ıen decision of this SS1 is denied, the thrust of the pressure pulse wave sensor 46 is held at that optimal thrust DPO, and SS3 or subsequent ones is performed. However, it is the area SL of the predetermined field of the both es whose center lines of that criteria amplitude distribution curve are pinched as shown in drawing 7 while a criteria plitude distribution curve (criteria tonogram) is memorized in SS2, when decision of this SS1 is affirmed. And SR It :omputed.

·36] subsequently, in SS3, in order to remove a variation, the averaging operator of the amplitude distribution curve ıogram) which was alike till then and was acquired for every beat from the last gap judging or later is performed, and mean amplitude distribution curve (average tonogram) equalized by the predetermined within a time one is acquired. d decision-criterion value NM to which the content "N" of the number counter CN of beats which carries out ınting of the number of beats was beforehand set in SS4 It is judged whether it became the above. This decision-:erion value NM It corresponds to a gap judging period and the value equivalent to several beats thru/or about ten ıts is set up. In this SS4, it may be judged whether the decision-criterion time amount to which the elapsed time from last gap judging or later was set beforehand was reached.

·37] Since decision of the above SS 4 was denied, after "1" is added to the content "N" of the above-mentioned nber counter CN of beats in SS5 at the beginning, said three or less SS is performed again. And if decision of the ›ve SS 4 is affirmed while the above [SS / SS and / 5] 3 is performed repeatedly, it will set to SS6 corresponding to d artery gap judging means 82. Area change part deltaSL of a mean amplitude distribution curve to said criteria plitude distribution curve And deltaSR While being computed, respectively Area rate-of-change deltaSL / SL of determined within the limits of right and left of the center line of a criteria amplitude distribution curve And taSR / SR Based on difference (deltaSL / SL) - (deltaSR/SR), it is judged whether the gap to the press side 54 of the se wave sensor 46 of a radial artery 56 occurred.

·38] For example, since decision of the above SS 6 will be denied if above-mentioned difference (deltaSL / SL) - ltaSR / SR) is the value of zero or its near, the press location of the direction which crosses the radial artery 56 of the se wave sensor 46 in SS7 is held in the location till then. However, since decision of the above SS 6 will be affirmed t is the forward value or the forward negative value of magnitude more than the absolute value to which above-ntioned difference (deltaSL / SL) - (deltaSR / SR) was set beforehand In SS8 corresponding to said press location rection means 84, in the condition [that the thrust of the pressure pulse wave sensor 46 is maintained by the optimal ust with the optimal press force-control means 80 (S5)] Only a predetermined value is moved in the direction where gap to the press side 54 of the pulse wave sensor 46 of a radial artery 56 decreases with crosswise migration ıipment 64 by the pulse wave sensor 46. for example, -- the case where it is negative although the pulse wave sensor is moved to left-hand side, i.e., a radius side, when above-mentioned difference (deltaSL / SL) - (deltaSR / SR) is ward -- the pulse wave sensor 46 -- right-hand side, i.e., a tendon, -- it is moved to a side.

·39] As mentioned above, according to this example, it sets during the continuous blood-pressure monitor using :sumed blood pressure. When the gap to the press side 54 of the pulse wave sensor 46 of a radial artery 56 is judged the artery gap judging means 82 (SS6) So that a location gap of the pulse wave sensor 46 may decrease with the :ss location correction means 84 (SS8) in the condition [that the thrust of the pressure pulse wave sensor 46 is intained by the optimal thrust with the optimal press force-control means 80 (S5)] with crosswise migration ıipment 64 The pulse wave sensor 46 is moved. For this reason, since the location gap to the criteria location, for ımple, the center position pressure sensing element, of the press side 54 of a radial artery 56 is canceled without rting optimal press localization actuation and optimal thrust decision actuation, a blood-pressure monitor is continued ımptly. [of the pressure pulse wave sensor 46] [0040] According to this example, moreover, the artery gap judging

ans 82 (SS6) In the condition that the thrust of the pressure pulse wave sensor 46 is maintained by said optimal thrust h said optimal press force-control means 80 (S5), and a living body's presumed blood-pressure value is determined the presumed blood-pressure value decision means 74 (S9) It is based on the pressure pulse wave detected by two or re pressure sensing elements of the pressure pulse wave sensor 46. It sets a 2-dimensional coordinate (drawing 7) as location shaft in which the location of the amplitude shaft in which the amplitude of the pressure pulse wave is wn, and the above-mentioned pressure sensing element is shown. It asks, the amplitude distribution curve, i.e., the ogram, in the press side 54 which shows the relation between the amplitude of the pressure pulse wave, and the ation of a pressure sensing element, and the location gap to the criteria location of the press side of said artery is ged based on the symmetric property centering on the center line with which the amplitude distribution curve was set beforehand. More specifically the above-mentioned artery gap judging means 82 (SS6) each change condition 80), for example, the optimal press force-control means, of the predetermined section of area, [of the both sides said ose center lines are pinched among the above-mentioned amplitude distribution curves] [of a couple] When the ssure pulse wave sensor 46 is pressed by the optimal thrust by press equipment 62 Area SL of the couple of the determined section of the both sides said whose center lines in a ********** distribution curve are pinched And SR ange rate deltaSL / SL And deltaSR / SR A gap of an artery is judged based on a difference. For this reason, there are uracy and an advantage which can judge a gap of a radial artery 56 easily comparatively.

41] As mentioned above, although one example of this invention was explained based on the drawing, this invention pplied also in other modes.

42] For example, in the above-mentioned example, it sets for the pulse wave gap judging means 82 (SS6). Area rate-change deltaSL / SL of predetermined within the limits of right and left of the center line of a criteria amplitude ribution curve And deltaSR / SR Although it was judged based on difference (deltaSL / SL) - (deltaSR / SR) whether gap of an artery occurred Area SL of a couple And SR A difference or area increment deltaSL And deltaSR A gap of artery may be judged based on a ratio.

43] Moreover, although SS2, SS4, and SS5 for computing a mean amplitude distribution curve were prepared in the mple of above-mentioned drawing 9 , it does not necessarily need to be prepared.

44] Moreover, in the above-mentioned example, in order that an overarm might be equipped with a cuff 10 and the ssure pulse wave sensor 46 might detect the pressure pulse wave of a radial artery, the wrist was equipped, but the de peg may be equipped, in order that a cuff 10 may be wound around a femoral region and the pressure pulse wave sor 46 may detect the pressure pulse wave of the arteria dorsalis pedis of the near leg around which the cuff 10 is not und.

45] Moreover, in the above-mentioned example, in order to decrease a gap of a radial artery 56 with the press ation correction means 84, when the location of the pressure pulse wave sensor 46 is changed and presumed blood ssure changes a predetermined value or more than a predetermined rate, S6 less or equal corresponding to said blood-ssure value decision means 70 may be made to carry out automatically.

46] Moreover, the blood-pressure value measurement means 70 of the above-mentioned example was constituted so t blood pressure might be measured by the so-called oscillograph metric method, but even if it carries out blood ssure measurement with the so-called K sound method which determines the cuff pressure at the time of generating Korotkoff sounds, and dissipation as a highest-blood-pressure value and a lowest-blood-pressure value, it does not erfere.

47] In addition, in the range in which this invention does not deviate from the main point, modification may be led variously.

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OTICES *

his document has been translated by computer. So the translation may not reflect the original precisely.
*** shows the word which can not be translated.
the drawings, any words are not translated.

AWINGS

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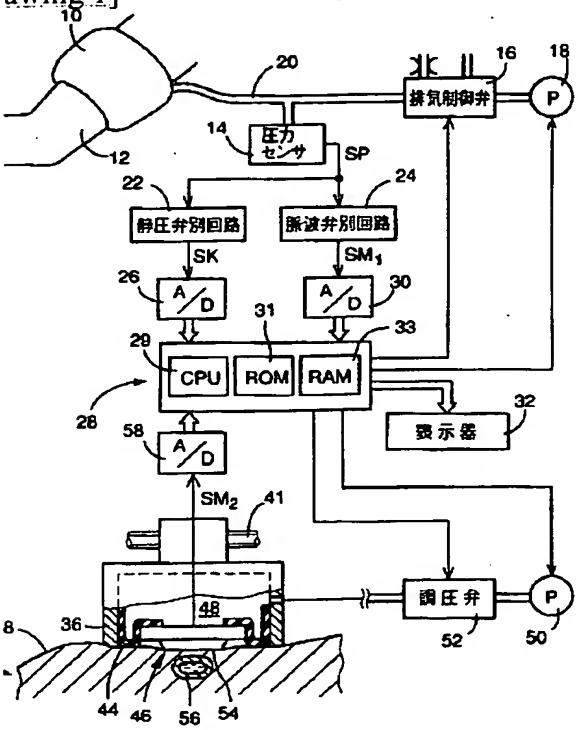
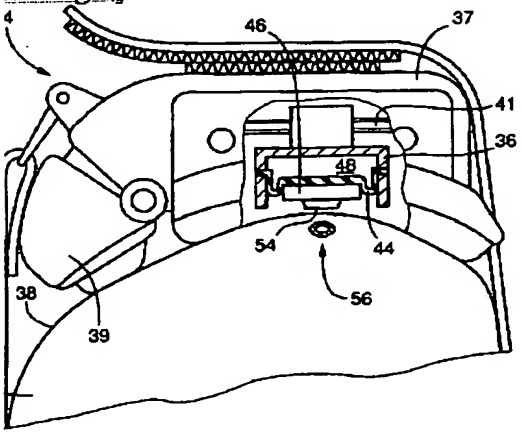
awing 1]



rawing 2]



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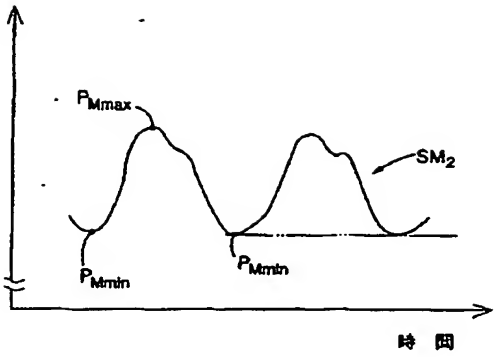
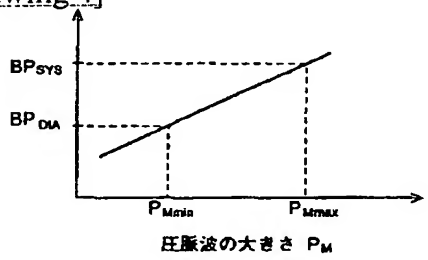
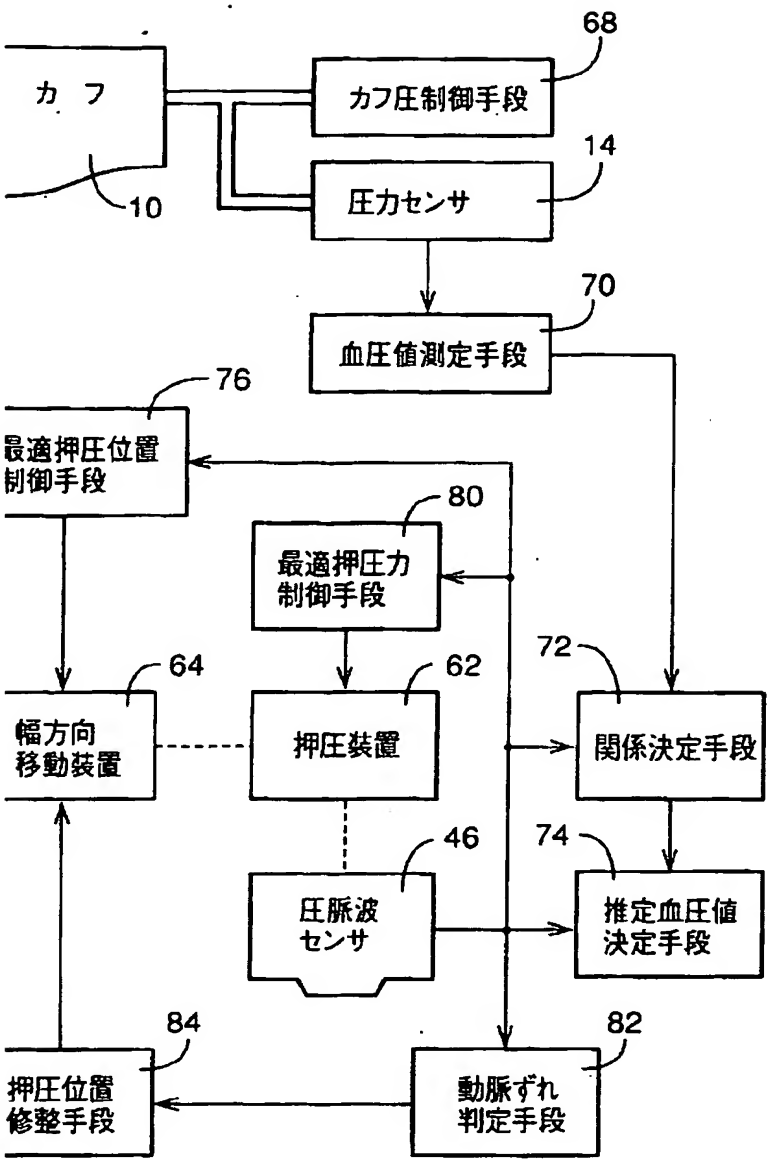


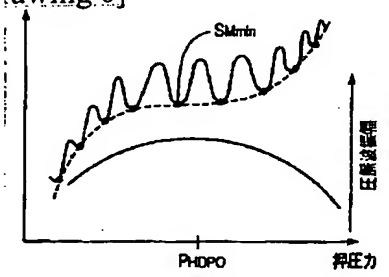
awing 4]



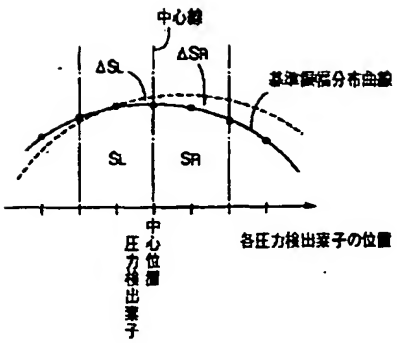
awing 5]



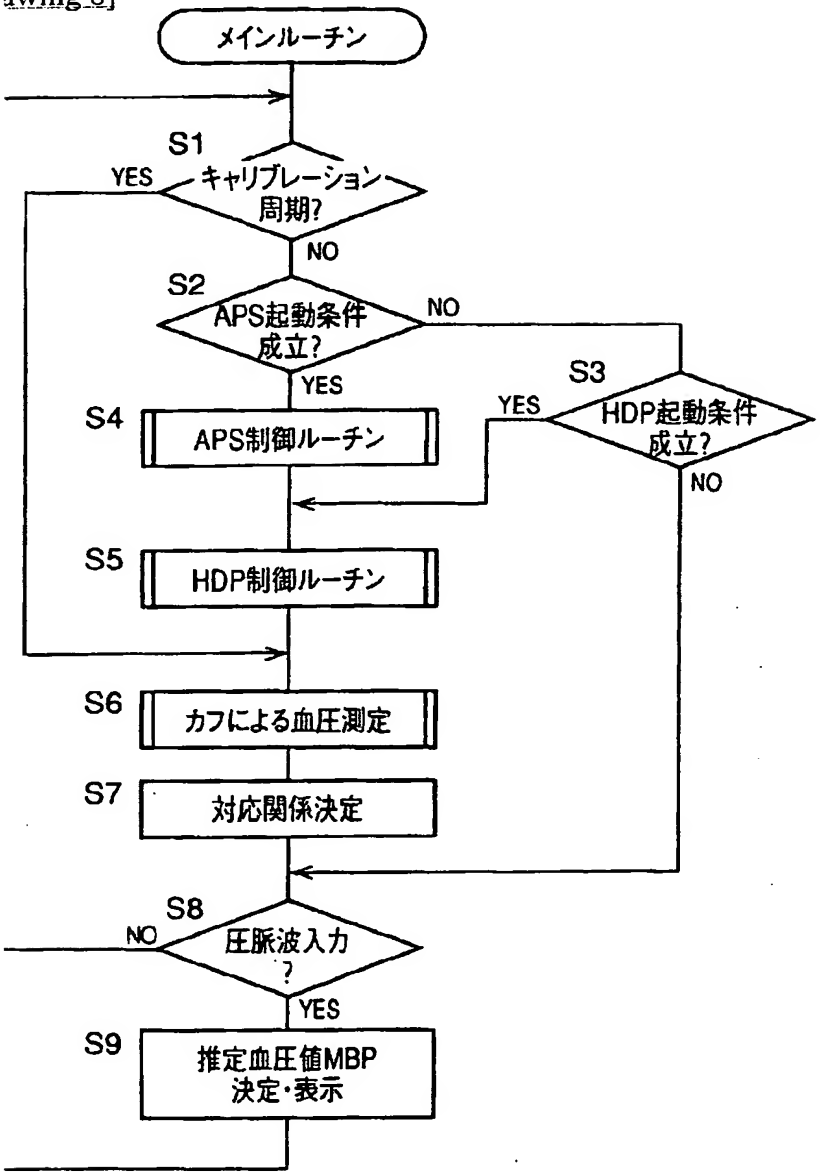
[Drawing 6]



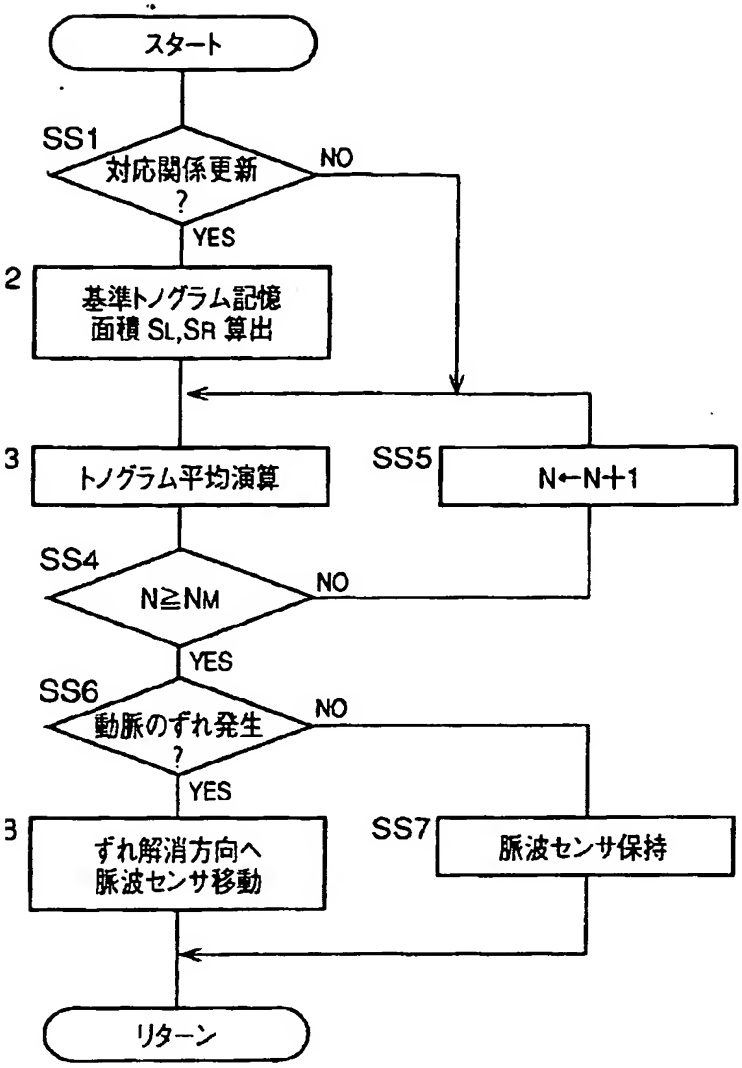
[Drawing 7]



awing 8]



rawing 9]



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